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A GLUT HERRING, *POMOLOBUS AESTIVALIS*, WITH AN ATTACHED COLONIAL HYDROID, *OBELIA COMMENSURALIS*

BY E. W. GUDGER

On March 27, 1936, Mr. Aycock Brown, a valued correspondent at Beaufort, N. C., wrote me that there had been taken in neighboring waters, a glut herring with an attached algal or hydroid growth, and his pencilled sketch showed this admirably. He stated that this specimen had been turned over to Dr. H. F. Prytherch, Director of the U. S. Bureau of Fisheries Laboratory at Beaufort. I at once wrote Dr. Prytherch urging him to describe this interesting fish and growth. This he promised to do,

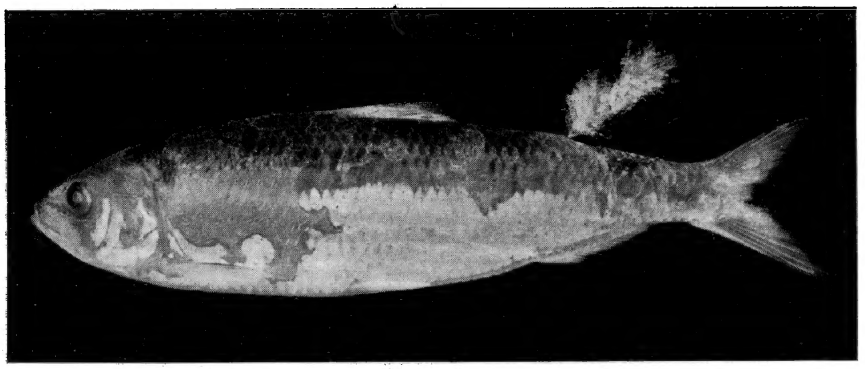

Fig. 1. The fish (*Pomolobus aestivalis*) and the hydroid (*Obelia commensuralis*).

but his interests were in other forms of life and his time was crowded with other work. So presently he presented the fish to the American Museum, at the same time urging me to describe it, especially since (as he wrote), "You have published on this phenomenon of hydroid growths on fishes." The articles that I have written on this phenomenon being compilations of accounts deeply buried in the literature, I welcome the opportunity of describing at first hand a case of this kind.

THE FISH WITH THE HYDROID GROWTH

The fish in question was identified by my colleague, Mr. John T. Nichols, as the common "glut herring," *Pomolobus aestivalis.* It ranges from St. John's River, Florida, to the British Maritime Provinces, but is especially abundant in the North Carolina sounds where it is found in great schools. It is a small fish, the present specimen measuring 10.4 in. long from tip to tip, and 2.4 in. in depth. Its present weight is 6 oz. The hydroid has been identified by Dr. Willard G. Van Name as *Obelia commensuralis* McCrady. Its range is from South Carolina to Nova Scotia.

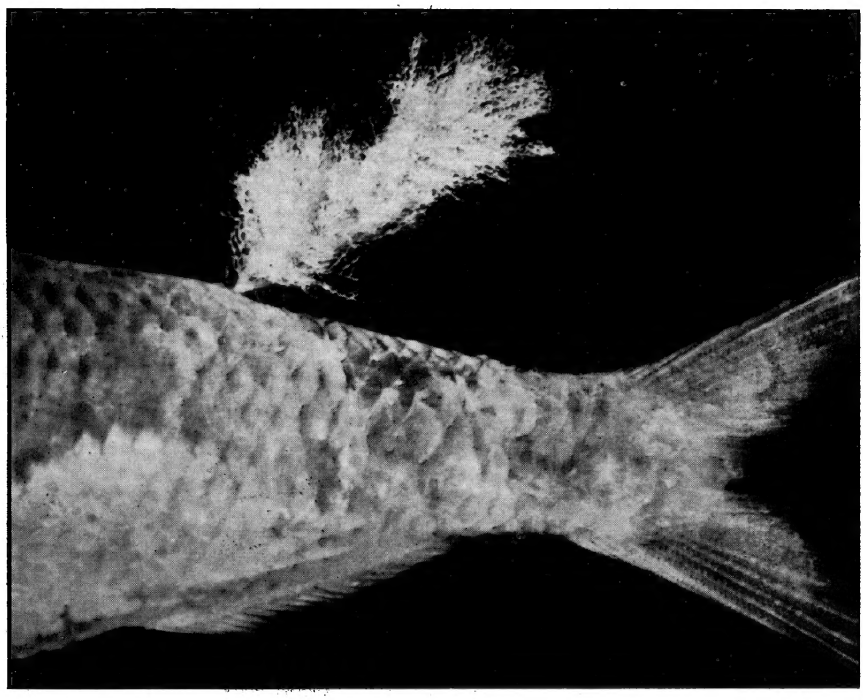

Fig. 2. Enlarged view of tail of fish with attached hydroid, to show details.

Fig. 1 shows the fish lying on its side in a dish of water with the hydroid floating free at an angle of about 45° to the axis of the host. The fish in handling has lost a number of scales particularly behind the gills, but is otherwise in very good condition. There is nothing to show that the herring when alive was not entirely healthy and normal. Fig. 2 shows the tail portion of the fish and the hydroid much enlarged, to give more detail.

The fish and associated hydroid were taken February 18, 1936, by Burnie F. Willis of Beaufort, in Bogue Sound, opposite Morehead City, N. C. It was found in a catch of other fishes in a haul seine, and was only distinguished from other glut herring by the plumose hydroid attached to its back. Fortunately Mr. Willis, seeing that it was a "freak" fish, brought it to the Laboratory and presented it to Dr. Prytherch.

The hydroid (*Obelia commensuralis*) grows exactly midway between the hinder base of the dorsal fin and the origin of the caudal fin (45 mm. from each). It arises squarely in the mid-dorsal line in a funnel-shaped opening. The horny stem, where it emerges from underneath a saddle-like dorsal scale, has been frayed down to the size of a no. 8 thread. Farther out in the colony where it is of normal size, this stalk measures about 1.5 mm. in diameter. The central stem, growing smaller all the way may

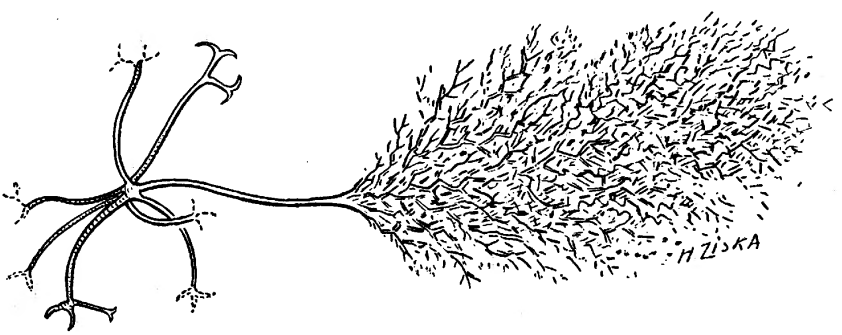

Fig. 3. Drawing of hydroid (diagrammatic) and of hydrorhiza to show proliferation of holdfasts for anchorage in muscular tissues of the fish.

be traced out as a main stalk about 37 mm. from the point of emergence. The total length from point of emergence to tip of outermost "frond" is 47 mm. The greatest breadth of the growth is about 25 mm. as it floats in water. The hinder (under) side of the main stem for about 18 mm. backward is devoid of branches. This must have rested on the back of the fish when this was swimming. And curiously enough the dorsum of the fish from the point of attachment of the hydroid 38 mm. backward is light in color, the epidermis is gone and the scales are soft and formless—the bony material is gone. There seems here to have been both erosion and corrosion. The rubbing of the horny hydroid has probably worn off the epidermis, and since the hard part of each scale is gone one wonders if the hydroid gave off some kind of acid which decomposed the scale.

In surface view this looks like a case of parasitism. The hydroid is

surely rooted not in the scales and epidermis of the fish, as has been reported for other specimens, but in the muscles. To determine this matter I asked help from another colleague, Mr. Harry C. Raven, an expert dissector. When he had got down into the dorsal muscular tissue, what was found is shown in Fig. 3. In this figure the structures are considerably enlarged and the external part of the hydroid is drawn entirely diagrammatically.

The horny stem of the hydroid, just under the scales and skin of the fish, gives off 7 branches in a more or less vertical plane. The most superficial ones cross each other and their extremities were broken off. Two others run clear for a distance of about 3 mm. and then each gives off two or three branchlets. At the node where the branching takes place, 3 branches extend nearly vertically down into the muscles of the fish. One, and the larger, seems central and the others are fore and aft of it. These are anchored in the muscular tissue of the fish's dorsum by a number of small branches. The combination of these holds the hydroid firmly anchored in and to the muscles of the fish.

On first and superficial examination it was plainly seen that the stem of the hydroid emerged from a funnel-shaped hole in the mid-dorsal line of the fish, and that it was firmly and securely anchored in the flesh. In fact it was so solidly fast that it was clear that no ordinary pull would dislodge it. The funnel-shaped hole out of which the stalk emerged had plainly been enlarged by the swaying of the extensive mass of the branched hydroid as the fish swam. Thus it was clear that the hydroid had grown into and had almost become a part of the flesh. Hence the conclusion was formed that this *Obelia* was parasitic on *Pomolobus*, that it was absorbing and living on the tissues of its host as a true parasite. However, this dissection shows that its parts below the scales and skin of the fish are not haustoria for food-absorption but mere holdfasts for anchorage. They have laid hold of the muscles in these unusual surroundings exactly as they would the rough surface of a wooden, concrete or metal pile, or of a shell or any rough surface out in the free water—their normal anchorages in nature. There is no evidence whatever of any wasting away of the muscles; these are entirely normal.

How the hydroid first became attached to the fish is a mystery. It seems plain that it could not affix itself to the relatively large and closely overlapping scales of the herring. We know that the water-molds, *Achlya* and *Saprolegnia*, active and often fatal parasites on fresh-water fishes, can only attack when there is some abrasion of scales and skin. Then by analogy we must conclude that in some way one or more scales

were loosened or torn away on the back of this fish and that at and in this hurt place the floating young hydroid could lay hold with its holdfasts and proliferate these farther and deeper into the flesh of its host and thus anchor itself more and more securely.

I have spoken earlier of having brought together from widespread and hidden sources accounts of colonial hydroids attached to fishes. These may be found in full in an article, "Association Between Sessile Colonial Hydroids and Fishes,"[1] published in 1928. Part of this data was used also in the first of a series of articles bearing the general title "Coelenterates as Enemies of Fishes." No. 1 of this series appeared in 1934.[2] In these papers all the data concerning the association of hydroids and fishes known to me is brought together, and to these papers the interested reader is referred.

However, it may be well briefly to state here that in the first paper (1928) mere association was shown in the case of four hydroids; alleged but not proven parasitism in two forms; and definite parasitism proven for a hydroid in the *ovarian eggs* of a Russian sturgeon, and for another hydroid found on three fishes in Durban Bay, South Africa. The hydroid (*Hydrichthys mirus*) in this case forms a plate-like hydrorhiza which spreads out over the fins of its host. From the hydrorhiza are sent down into the tissues of the host haustoria which suck up blood until their cavities are filled with red corpuscles. All this was found by cutting sections of hydrorhiza and fin.

In the specimen before me, there is no plate-like hydrorhiza and hence no haustoria for parasitism. The hydrorhiza consists of a simple small stem (Fig. 3) no larger than a heavy thread. This, it is true, penetrates into the flesh of the host but only to break up into many small roots and smaller rootlets. Hence there is here a mere holdfast comparable to what is found on a similar hydroid growing on a pile under a wharf or to some other inanimate object in the open sound or ocean.

What then is the peculiar form of association between these diverse organisms? This is somewhat hard to answer. There is not here the purpose of protection or concealment such as is found in some crabs, hermits or free-livers, where hydroids are actually planted on shell or carapace to hide the host from enemies. It has been shown that there is no parasitism. It seems unlikely that the relationship is a symbiosis since neither gives anything to the other so far as can be seen. It can hardly be a case of commensalism even though both animals feed on microscopic marine organisms.

[1] Gudger, E. W. Ann. Mag. Nat. Hist., 1928, (10) VIII, pp. 17–48, 13 figs.
[2] Gudger, E. W. Ann. Mag. Nat. Hist., 1934, (10) XIII, pp. 192–212, 7 text-figs., 2 pls.

This leaves for consideration that form of animal association known as inquilinism, or a lodger-host relationship in which neither specifically benefits the other. Does someone say that the hydroid gets carried about and thus has a surer chance of getting its food? But this hardly appeals to one who has seen the luxuriant growth of hydroid colonies on wharf piles. The ebb and flood of the tides surely take care of the matter of the hydroids' food.

To me it seems that the association between *Obelia* and *Pomolobus* is a mere fortuitous or accidental case of feeble and unpurposeful inquilinism.